3,129,489
SPLICER

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8 Claims. (Cl. 29—21.1)

This invention relates to a splicer and more particularly to a splicer for continuously running strips of metal.

The instant splicer has been designed to splice together sheets of metal without stopping or even retarding the motion of the sheets. The invention comprises a cutting station and a pressing station, which will act upon the trailing end of a used roll and the leading end of a new roll to splice the two together.

The cutting station comprises a pair of lancing rolls; one roll has a plurality of teeth and is on one side of the sheets of metal; the other roll has a plurality of chambers corresponding to those cutting teeth and is opposite the first roll. A single revolution of the lancing rolls will cut out and bend down a plurality of rows of tabs staggered along the width of the sheets.

After passing a pair of folding blocks above and below the sheets which fold the tabs back over toward the metal, the sheets pass through the pressing station. The pressing station comprises a pair of relatively movable rollers which may have the distance between them adjusted for different material thicknesses. One roller is on either side of the sheets to press the tabs against the sheets of metal. One of these rollers has grooves in it so that the tabs may be pressed up into the metal. The resulting splice, as the sheets pass out from the pressing station, is a strong one which has been accomplished without stopping the movement of the metal sheets.

An object of the invention is to provide a splicing machine for splicing together two sheets of metal without retarding their rate of motion past the splicing machine. More particularly it is an object of the invention to provide a splicing machine whereby the motion of the sheets of metal cooperates with the splicing device, but yet which produces an extremely strong connection.

Another object of the invention is to provide a splicing machine which will splice a wide area of a pair of sheets of metal.

A further object of the invention is to provide a splicer for moving sheets of metal which produces a splice having no sharp edges at the folded portions.

An additional object of the invention is to provide a splicer which will cut a splice into moving material but which thereafter will not interfere with the movement of that material.

Still a further object of the invention is to provide a splicer having means to adjust the mechanism for different material thicknesses.

Yet another object of the invention is to provide a splicer having means for automatically stopping the splicing action after a splice has been applied.

Other objects will appear from the description.

In the drawings:

FIGURE 1 is a plan view of the splicer;

FIGURE 2 is a partial side elevation showing a portion of the left side as viewed from FIGURE 1;

FIGURE 3 is a partial side elevation taken from the right of FIGURE 1;

FIGURE 4 is a view in section taken along the lines 4—4 of FIGURE 1;

FIGURE 5 is a view in section taken along the lines 5—5 of FIGURE 1;

FIGURE 6 is a view in section taken along the lines 6—6 of FIGURE 1;

FIGURE 7 is a view in section taken along the lines 7—7 of FIGURE 1;

FIGURE 8 is a view partly in section taken along the lines 8—8 of FIGURE 1;

FIGURE 9 is a view in section taken along the lines 9—9 of FIGURE 4;

FIGURE 10 is a view in section taken along the lines 10—10 of FIGURE 8;

FIGURE 11 is a partial plan view of one side of the frame and roller eccentric assembly;

FIGURE 12 is a diagrammatic view showing the splicer at the beginning of a splicing operation;

FIGURE 13 is a view similar to FIGURE 8 but showing a different stage of operation of the splicer;

FIGURE 14 is a view similar to FIGURES 8 and 9 showing still a different stage of operation;

FIGURE 15 is a diagrammatic view showing the pressing rolls in operation; and

FIGURE 16 is a partial view of the spliced product of the instant splicer.

In the preferred embodiment illustrated, the splicer might be regarded as having a plurality of stations, namely, a cutting station 21, a folding station 22, and a pressing station 23. All of the stations cooperate to produce the splice, hereinafter described, to a plurality of sheets of metal.

The splicer illustrated is designed to splice materials up to 36 inches wide and .040 inch thickness. However, it is to be understood that materials of much greater width and thickness may be used with the instant invention, governed only by the size of the machine.

The sheets of metal will be of the type which are traveling or continuously in motion. Such metal sheets might, for instance, be fed to a conveyer or be used on an assembly line.

The sheets of metal are shown feeding into the splicer from the right of the view in FIGURE 4. The lower sheet 26 will have nearly reached its end when the upper sheet 27 has its beginning fed into the machine. The splice will then take place without having to retard the movement of the roll 26 so that the new roll 27 immediately follows it in motion.

Two pairs of rollers are illustrated as guiding the sheets of metal into the splicer. The sheets 26 and 27 first meet the rollers 30 and 31, which are separated somewhat, to roughly guide the sheets toward the splicing mechanism. The sheets will then be fed between the rollers 32 and 33, which are closer together, to more accurately position the sheets of material. It should be obvious that means other than the rollers 30 through 33 illustrated may be used for this purpose, as for instance, stationary strips of metal placed above and below the path of the sheets and converging toward one another as the stationary strips are nearer the splicing mechanism.

The rollers 30 through 33 may be attached to a pair of sides 34 and 35 of a frame 40 by any convenient means. That illustrated is the reduction of the ends of the rollers 30 through 33 to the form of short circular shafts 36 (at either end of the rollers 30 and 31) and 37 (at either end of the rollers 32 and 33). These shafts 36 and 37 will rotatingly protrude through the sides 34 and 35 of the frame 40, as illustrated in FIGURE 1, and will usually be mounted within bearings in a manner well known in the art.

The frame 40 may be any suitable means to which the mechanism to be described may be attached. Preferably, the frame 40 will be formed of heavy steel sheets to which are welded channel members to support the several elements of the splicer. The frame 40 should be one which may be bolted to a floor to provide a sound foundation for the splicer. Further details of the frame will be more conveniently postponed to an elemental description along with the various portions of the splicer with which they are associated.

The sheets 26 and 27 would first be fed by the rollers

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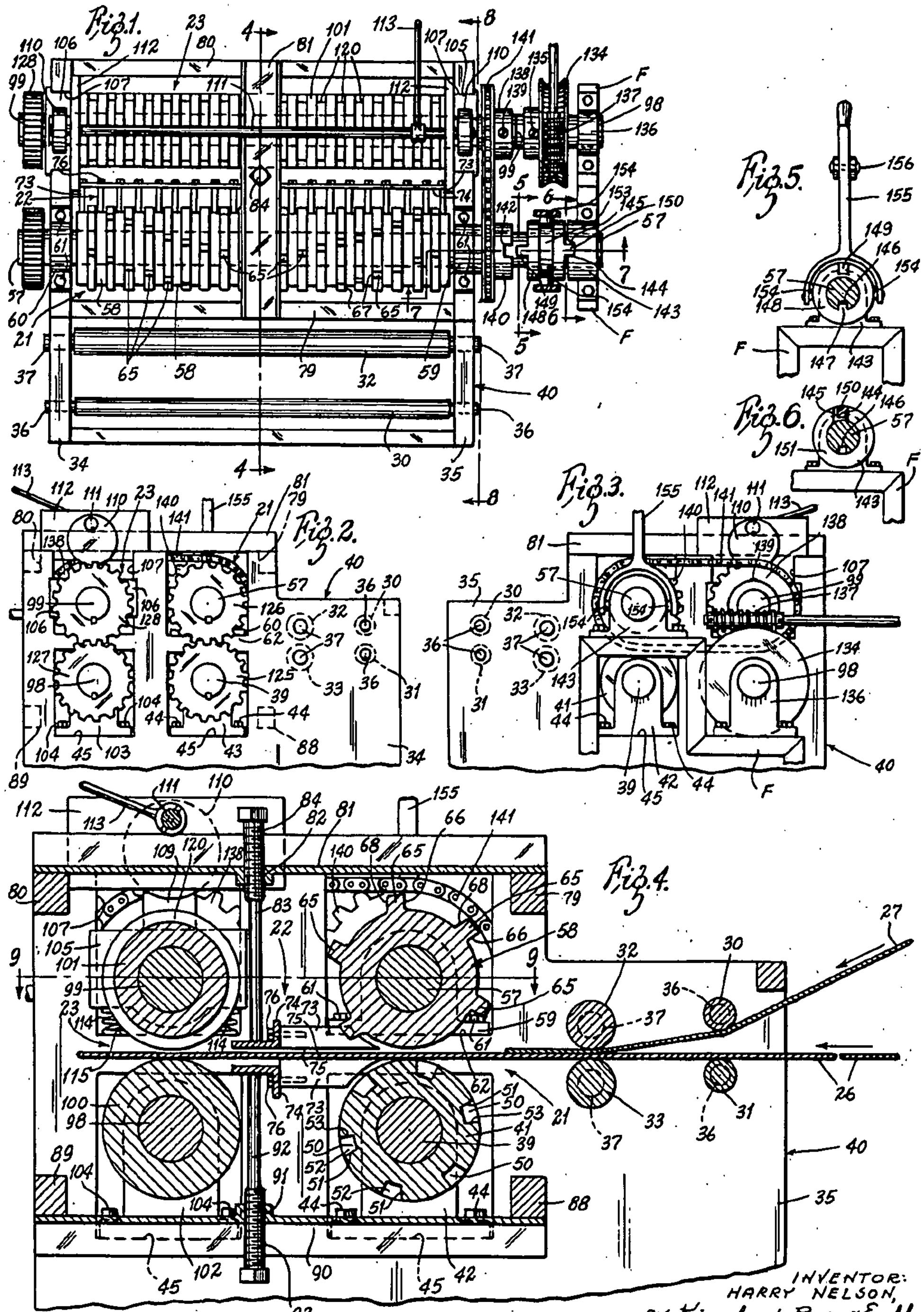

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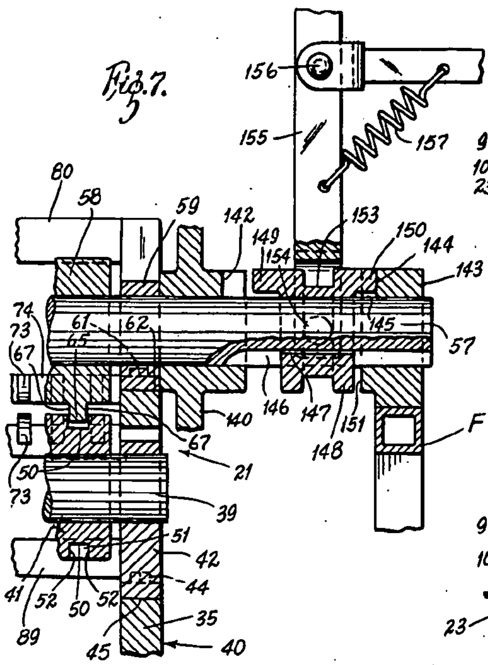

Fig. 7.

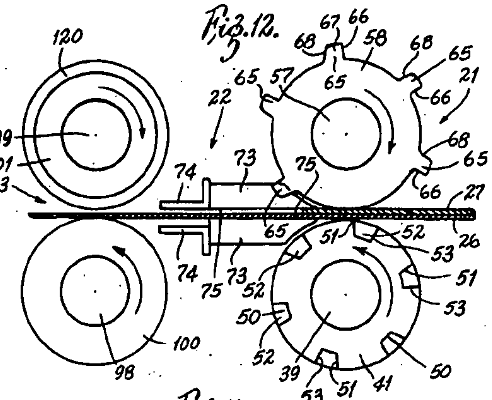

Fig. 12.

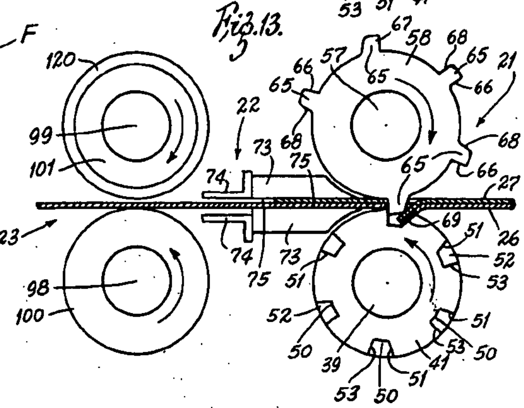

Fig. 13.

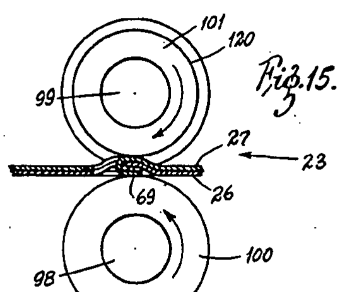

Fig. 15.

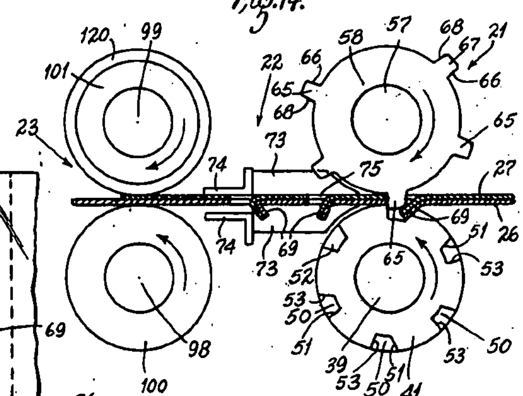

Fig. 14.

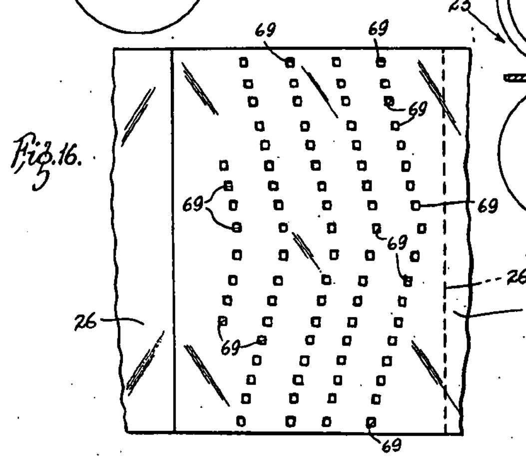

Fig. 16.

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Fig. 8.

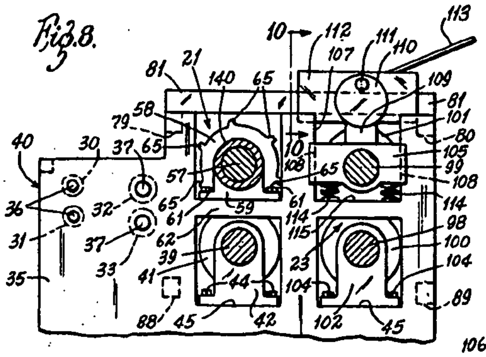


Fig. 10.

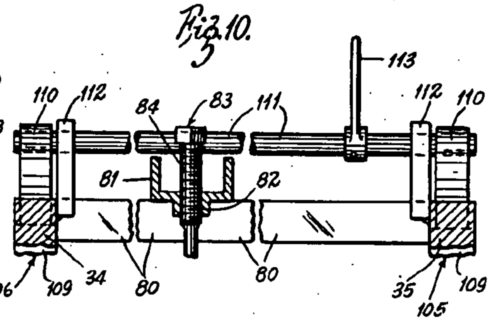


Fig. 9.

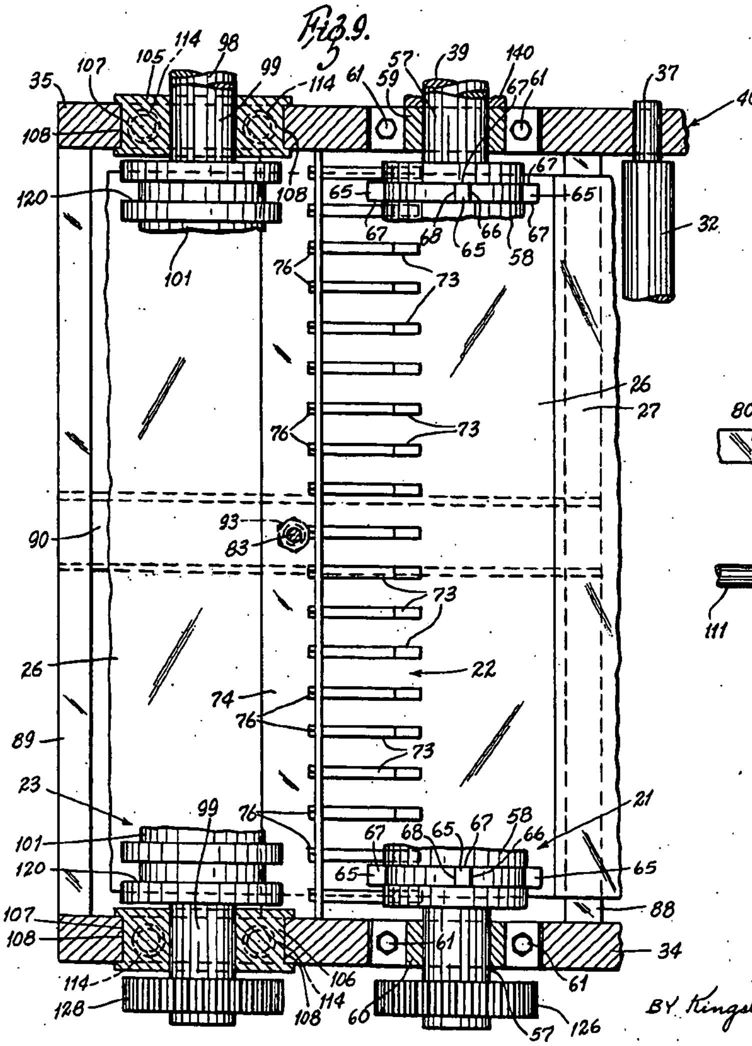
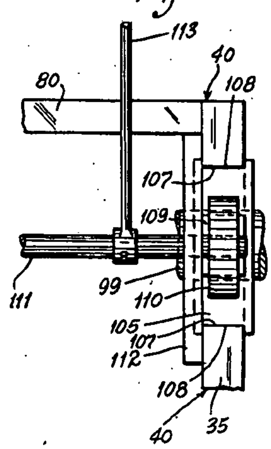


Fig. 11.



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30 through 33 to the cutting station 21. The cutting station 21 comprises a pair of large cylinders or drums, which may be either hollow or solid.

A shaft 39, carrying the lower drum of the cutting station 21, will be journaled in a pair of bearings 42 and 43. The bearings 42 and 43 may each be bolted to one side of the frame 40 by bolts 44. The frame 40 should include spaces in which the various bearings may be positioned for seating, as well as channels to which these bearings may be bolted. For instance, the bolts 44 may be attached to a plurality of shelves 45, a pair of which are cut out so as to be coplanar on either side 34 and 35 of the frame.

The drum or cylinder 41 should be long enough to extend virtually the entire distance between the two side members of the frame 40.

The diameter of the drum 41 is not critical except that it must be large enough to contain a plurality of rows of cavities 50. In the preferred embodiment six such rows are shown, and each row is staggered along the length of the drum 41. It will be observed that the cavities 50 are also arranged in axially spaced rows about the periphery of the drum.

Each cavity 50 is shown as having a leading cutting edge 51, a pair of side cutting edges 52 (shown in FIGURE 7), and a trailing edge 53 which is not a cutting edge. As the drum 41 rotates within its bearings 42 and 43 (in a counterclockwise direction as viewed from the left side of FIGURE 1) successive staggered rows of the cavities 50 will pass a designated cutting station at which they will cooperate with a similar number of staggered cutting teeth in a manner presently to be described.

A shaft 57 carrying the upper drum 58 is journaled in a pair of bearings 59 and 60 which are similar to the bearings 42 and 43. Bolts 61 hold the bearings 59 and 60 to a pair of shelves 62 on either side of the frame 40. The drum 58 is the same width as the drum 41 and preferably of the same diameter. However, corresponding to the cavities 50 of the drum 41, the drum 58 has a plurality of staggered rows of cutting teeth 65 also arranged in axially spaced rows. Each of the cutting teeth 65 has a leading cutting edge 66, a pair of cutting side edges 67 and a trailing back edge 68 which is not a cutting edge.

It will be observed from the drawings that the drum 58 includes a blank space between two rows of cutting teeth 65. The blank space extends the full length of the drum 58, and, when the drum 58 is in its rest position, the blank space will be opposite the sheets 26 and 27 passing by. Thus, the drum 58 may operate through the cutting teeth 65 to make a splice and then return to a rest position which does not interfere with the movement of the sheets of metal.

The teeth 65 are so spaced and each row of teeth is so spaced that, as the drums 41 and 58 rotate at a designated speed, which will be the same for both if both are the same diameter, each tooth will cooperate with a cavity 50 to provide a cutting action as the two meet at a cutting position, generally that position shown in FIGURES 13 and 14. The cutting surfaces 66 and 67 of each tooth are of a size and shape to provide a tight fit with the cutting surfaces 51 and 52 of each cavity 50.

The drum 58 rotates in a clockwise direction as viewed from the left of FIGURE 1. It can be seen that as the two drums 41 and 58 rotate so that their cutting members 50 and 65 approach one another, the leading cutting surface 51 will first engage the leading cutting surface 66 of a cutting tooth 65. As the drums 41 and 58 rotate further the cutting surface 66 will protrude further into the cavity 50 and a portion of the side edges 67 of the cutting tooth 65 will project within the cavity 50 tightly against the cutting surfaces 52. This cooperative cutting action of the side surfaces 52 and 67

will have a cutting effect upon any material between the rollers 41 and 58.

A plurality of tabs 69 of the general cross sectional shape of a cutting tooth will be cut in the material. As the drums 41 and 58 rotate still further so that the cutting tooth 65 begins to retract from the cavity 50, the trailing surfaces 68 and 53 not being cutting surfaces, there will be no incision made upon the fourth side of the tab 69. The material passing from the drums 41 and 58 will accordingly have projecting downwardly at approximately right angles from it a plurality of tabs of metal.

It is desired to provide means to prevent the sheets of metal which pass between the rollers from following the rollers or wrapping around the rollers as the rollers continue to turn and as the material travels away from the rollers. In the illustrated embodiment, a plurality of strippers 73 are provided.

It is also desired to provide a means for folding back the tabs 69 which have been cut into the sheets by the drums 41 and 58. These folding means may be in the form of angles 74 extending between and welded to each side 34 and 35 of the frame 40. The angles 74 also provide a convenient point of attachment for the strippers 73.

The strippers 73, a row being on each side of the metal sheets as they pass between the strippers, should be narrow enough to fit between the axially spaced rows of cutting teeth 65 so that they may be placed as close to the drums 41 and 58 as possible. Accordingly the surface 75 closest to the metal sheets 26 and 27 may be longer than the other surfaces so that these surfaces 75 can extend further toward the drums 41 and 58. It should, however, be recognized that the shape of the strippers 73 is not limited to that illustrated.

The strippers 73 may be conveniently attached by bolts 76 to the angle members 74. Thus, the angle members 74 permit the elimination of a separate attaching means for the strippers 73. The angle members 74 have a horizontal surface on either side of the sheets of material 26 and 27 which pass between them.

It can be seen that as the moving sheets of material 26 and 27 pass the drums 41 and 58, the strippers 73 will engage the leading edges of the sheets so that the sheets will be prevented from wrapping around the drums 41 and 58. As the sheets pass beyond the strippers, and the tabs 69 cut into the sheets by the cutting members 50 and 65, approach the folding members 74, these tabs 69 will be caught by the lower folding members 74, and, as the sheet will be restrained by the upper folding member from flexing upwardly, the tabs 69 will be bent back away from the hole from which it was cut. In this manner the folding members 74 will fold back all the tabs which pass between them.

The frame 40 may have welded to it a pair of cross members 79 and 80 which will serve to brace the two sides of the frame. These cross members 79 and 80 may also support a channel 81 spanning the center of the splicer. The channel member 81 may be welded to the cross members 79 and 80 and may include a threaded hole 82. Through the threaded hole 82 a rather long adjusting rod 83 having a threaded portion 84 may serve to clamp down upon the upper folding member 74 at the center thereof to prevent that folding member from buckling in the middle.

At the lower portion of the frame 40, additional cross members 88 and 89 may provide further strengthening to the frame 40. These cross members 88 and 89 may also support a channel member 90 similar to the channel member 81 which will have a threaded portion 91 through its middle. Another rod 92, threaded at 93, may extend through the threaded portion 91 to provide a clamping action at the middle of the lower folding member 74 ot prevent that folding member from buckling in its middle. The rods 83 and 92 may be adjusted against the folding members 74 according to their relative spacing.

The pressing station 23 includes a pair of drums arranged in vertical tandem. Two shafts 98 and 99 carry drums 100 and 101, respectively. The shaft 98 is rotatable in bearings 102 and 103, bolted at 104 to the shelves or angle members 45 of the frame 40.

The shaft 99 carrying the drum 101 is mounted in vertically movable bearings 105 and 106. These bearings 105 and 106 are slidably mounted upon either side 34 and 35 of the frame 40 within a slot 107 cut into each of those sides.

The bearings 105 and 106 each have square grooves 108 cut out of either side adjacent the slots 107 (see FIGURE 9). The vertical edges of the slots 107 will rest within the grooves 108 of the bearings, permitting the bearings 105 and 106, and therefore the drum 101, to slide vertically.

Each of the bearings 105 and 106 has a cam follower 109 at its top for cooperation with an eccentric cam 110. Each eccentric cam 110 is rotatably attached by way of a shaft 111 to a pair of cross members 112 welded to the inner surface of each side 34 and 35. Attached to the shaft 111 is an operating handle 113. Thus, as the handle 113 is turned, it will rotate the shaft 111, and therewith, the eccentric cams 110. As the eccentric cams 110 are rotated, their driving relationship to the followers 109 of the bearings 105 and 106 will cause the drum 101 to be lowered as desired.

A plurality of compression springs 114 are held between the lower surface of the bearings 105 and 106 and the lower surfaces 115 of the slots 107. These springs tend to urge the bearings 105 and 106 upwardly and will do so when relieved by the cams 110.

When the drum 101 is raised, it will be out of contact with the sheets passing beneath it. The drum 100 will also be out of contact because the sheets ordinarily pass slightly above the latter drum. Contact with the drum 100 is made because when the drum 101 is lowered, it flexes the moving sheets downwardly slightly so as to make contact with the drum 100.

It will be observed that the movable mounting of the drum 101 permits a single machine to be used with various sheet thicknesses, since the distance which that drum is lowered depends only on the action imparted to the cams 110.

The lower drum 100 is of approximately the same diameter as the lower drum 41. The drum 100 has a smooth surface. The upper drum 101 is, in the illustrated embodiment, of the same diameter as the drum 100. However, the drum 101 has a plurality of grooves 120, each extending about the complete periphery of the drum, and each spaced to coincide with the position of a radial row of teeth 65. Each groove 120 is cut to a depth which is about equal to the total thickness of the sheets of metal passing between the drums 100 and 101.

The drums 100 and 101 serve as pressing drums for the folded tabs 69. If the handle 113 has moved the drums into operating position, they will press the sheets of metal together, the drums 100 and 101 being separated by only the distance equal to the thickness of the sheets of metal. When the splice passes between the drums, the added thickness of the folded over tabs 69 must accordingly be pressed toward the sheets. The grooves 120 are provided to cause the tabs 69 to be pressed into the metal. In other words, the grooves 120 permit the upper surface of the sheets (the surface away from the tabs) to be formed between the grooves 120 and outwardly from the surface of the sheets (see FIGURE 15). Correspondingly, the tabs 69 can be pressed into the lower surface of the sheet 26 so that the tabs are flush with the lower surface, even at the area of the splice. This permits a splice which will not have the customary rough and jagged edges presenting their well known harmful effects.

FIGURES 1 and 2 illustrate a plurality of gears which insure the proper speed relationships between the pairs of drums which comprise the stations 21 and 23. As seen in FIGURE 2, the drums 41 and 58 have their relative speeds determined by a pair of spur gears 125 and 126 secured to the shafts 39 and 57. In the preferred embodiment, the drums 41 and 58 are of the same diameter so that the gears 125 and 126 will have the same diameters and the same number of teeth. Accordingly, the drums 41 and 58 will be caused to move at the identical rotational speed by the gears 125 and 126.

In similar manner, the drums 100 and 101 are preferably of equal diameter. In the preferred embodiment, they are also of the same diameter as the drums 41 and 58. The gears 127 and 128 attached to the shafts 98 and 99 determine the relative speeds of the drums 100 and 101, that speed being the same for both drums. It will be appreciated that the teeth of the gears 127 and 128 are such that the thickest sheets used with the machine will not separate the drums 100 and 101 to such an extent as to unmesh these gears.

The driving mechanism for the splicer will now be described. This mechanism is best seen in FIGURES 1, 3, 5, 6 and 7. The shaft 98, upon which the drum 100 is rotatable, extends away from the splicing machine so as to comprise a driving shaft. This extension of the shaft 98 has a worm gear 134 attached by a setscrew 135. The exterior end of the shaft 98 may be journaled in an additional bearing 136 bolted to a suitable frame designated F.

In driving connection with the worm gear 134 is a worm 137. The worm 137 is connected to a source of power which permits a driving relation through the worm 137 and the worm gear 134 to the lower drum 100. Thus, when any power is applied to the mechanism, the lower drum 100 will rotate. Of course, the gears 127 and 128 will cause the rotation of the lower drum 100 to be transmitted to the upper drum 101, causing it to rotate at the same peripheral speed. The shaft 99 carrying the drum 101 extends beyond the frame 40 to permit the mounting of a sprocket wheel 138 held by a setscrew 139.

The shaft 57 upon which the upper drum 58 is journaled also extends exteriorly of the splicing mechanism. Mounted upon this extension of the shaft 57 is a sprocket wheel 140 generally similar to the sprocket wheel 138 before mentioned. However, the sprocket wheel 140 is not rigidly attached to the shaft 57, but is freely rotatable thereon. A sprocket chain 141 connects the two sprocket wheels 138 and 140 for driving connections from the former to the latter. Therefore, as soon as the power is connected, the sprocket wheel 138 will act through the chain 141 to cause the wheel 140 to rotate. However, since the wheel 140 is freely rotatable upon its shaft, the upper cutting drum 58 will not immediately rotate.

To cause a driving engagement of the upper cutting drum 58 with the sprocket wheel 140, a unique clutching arrangement is provided, which may be viewed in FIGURES 1, 5, 6, and 7. For this clutching arrangement, the sprocket wheel 140 will have a square cut out portion 142 on its outer surface.

The extension of the shaft 57 may be journaled in a bearing 143 which will also form part of the clutching mechanism. The bearing 143 is stationary and has a cut out portion 144 similar to the cut out portion 142, but having one side 145 relieved from the square configuration of the groove 142.

The shaft is splined at 146. The spline 146 cooperates with a rib 147 on a shifting member 148 to permit the shifting member 148 to be axially slidable upon the shaft, while being fixed in a rotational direction.

The shifting member 148 has a projection 149 adapted to fit within the cut away portion 142 of the sprocket wheel 140. The shifting member 148 has a similar projection 150 adapted to fit within the cut away portion 144 of the stationary bearing 143. These projections, as determined by the size of the shifting member 148, are

so spaced that only one of the projections **149** or **150** engages its adjacent cut away portion at a given moment.

The shifting member **148** has a circumferential groove **153** cut in it. The groove **153** permits the projections **154** of a shifting handle **155** to ride therein. The shifting handle **155** is pivoted about a bolt **156** as shown in FIGURE 5. The bolt **156** is suitably mounted in a stationary holder which may in turn be secured to the frame **40**. A tension spring **157** biases the shifting arm **155** so that the shifting member **153** is continuously urged into engagement with the stationary bearing **143**.

To drive the upper cutting drum **58** when the sprocket wheel **140** is rotating, the shifting lever **155** is manually or otherwise externally moved so that the shifting member **148** can be urged into engagement of its projection **149** with the cut out portion **142** of the sprocket wheel **140**. When the projection **149** engages the cut out portion **142**, the projection **150** will be released from the cut out portion **144** of the stationary bearing **143**. The projection **150** will then be in a position to ride upon the surface **151** of the stationary bearing **143** so as to maintain the projection **149** in an engagement with the cut out portion **142** as the projection **150** rides upon that surface **151**. The splined portion **146** of the shaft **57** cooperates with the ribbed portion **147** of the shifting member **148** to cause a driving engagement of the shifting member **148** with the shaft **57**. Thus, as the rotating wheel **140** causes the shifting member **148** to rotate with it, the shifting member **148**, while it is in engagement with the cut away portion **142**, will cause the shaft **57** carrying the upper cutting drum **58** to rotate. As the drum **58** rotates, the gears **125** and **126** will cause the lower cutting drum **41** to likewise rotate.

When the shaft has reached a complete revolution so that the projection **150** is again opposite the cut away portion **144** of the stationary bearing **143**, the tension spring **157** will cause the shifting member **148** to snap back into engagement with the stationary groove **144** and out of engagement with the rotating wheel **140**. At this point the drum **58** and therefore the drum **41** will stop rotating.

Operation

Before performing a splicing operation, the machine will be in its at rest position. The power will usually be off so that the drums **100** and **101** will not be rotating. The drums **100** and **101** will have been separated by rotation of the shaft **111**. The shifting member **148** will be locked in the stationary groove **144** so that the cutting drum **58** is resting with the blank portion directed downwardly. A sheet **26** from a roll of metal will be passing through the machine.

In the operation of the device, it will be recognized that it is desired to splice together a pair of sheets of metal **26** and **27** as the almost spent sheet of metal **26** is about to pass through the splicing mechanism. These sheets will usually be available as rolls of metal.

As the sheet of metal **26** is about to each its end, the beginning of a new row of metal **27** will be inserted between the rollers **30** and **31** and then between the rollers **32** and **33**. The plurality of rollers **30** through **33** serve to guide the sheets of metal toward the cutting station **21** of the splicer.

As the metal reaches the cutting station, the motor will be turned on, driving the worm **137**. The worm gear **137** will transmit its power to the worm gear **134** and therefore to the lower pressing drum **100**. The gears **127** and **128** will cause the rotation of the lower drum **100** to be transmitted to the upper drum **101**. (Rotation of the shaft **99** carrying the sprocket wheel **138** will cause rotation of the sprocket wheel **140**.)

The drums **100** and **101** will have been in their at rest position, that is, separated from the metal passing between them, to eliminate friction between the moving sheets **26** and **27** and the stationary drums **100** and **101**. However, after the power has been turned on the lever **112** may be engaged to urge the drum **101** toward the drum **100**.

As the new sheet of metal **27** passes between the two cutting drums **41** and **58**, the shifting lever **155** may be engaged to shift the shifting member **148** into engagement with the cut out portion **142** of the rotating sprocket wheel **140**. The rotating sprocket wheel **140** will then have its motion transmitted to the shifting member **148** and therefrom to the shaft **57** carrying the upper cutting drum **58**. The rotation of the upper cutting drum **58** will be transmitted through the gears **125** and **126** to the lower cutting wheel **41**.

The beginning of the cutting cycle can be seen in FIGURE 12. In this position the cutting drums **41** and **58** are in their at rest position ready to begin a rotation. Upon rotation of the cutting drums **41** and **58**, the first teeth to engage with their cavities will cut tabs **69** into the sheets **26** and **27** passing between the drums. This action can be seen in FIGURE 13. As each tooth, which is cutting out a tab **69** from the sheets **26** and **27**, projects further into its adjacent cavity **50**, the tab being cut out is caused to bend further into that cavity. The continued rotation of the shafts **39** and **57** will cause the cutting drums to rotate further so that the cutting teeth **65** will rotate out of engagement with their adjacent cavities **50**, leaving the tabs **69** cut out as shown in FIGURE 14. As the sheets pass from the cutting drums **41** and **58**, the strippers **73** engage the leading edges of the sheets **26** and **27** and prevent their rotating about the drums **41** and **58**.

The folding members **74** engage the tabs **69**, as shown in FIGURE 14, and bend each of the tabs backward away from the holes just cut.

As the sheets of metal pass between the pressing rollers **100** and **101**, the tabs **69** are pressed into the metal, as shown in FIGURE 15. The grooves **120** in the roller **101** permit the sheets to be pressed up into a slight bulge on the side away from the tabs **69**, and permit the tabs to be pressed up into the metal as shown in FIGURE 15. This type of pressing causes a much tighter and stronger splice than heretofore obtained, and prevents forces parallel to the sheets from causing the splice to come apart.

When the cutting drums **41** and **58** have made a complete revolution, the projection **150** again reaches a position opposite the cut out portion **144** of the stationary bearing **143**. The shifting member **148** is then again urged by the tension spring **157** to shift out of engagement with the sprocket wheel **140** thereby causing that wheel **140** to terminate its driving relationship with the shaft **57**.

After the last splicing cut out has passed between the pressing rollers **100** and **101**, the rollers **100** and **101** may be separated by the lever **113**, and the source of power cut out.

The finished product is shown in FIGURE 16. The staggered splices shown minimize compounding of weak points in the spliced sheets.

Various changes and modifications may be made in this invention as will be apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is

1. A splicing mechanism for splicing together a plurality of moving sheets of metal comprising; a pair of rollers between which the sheets pass; one of the rollers having a plurality of cutting teeth and the other a corresponding plurality of cutting cavities; said teeth and said cavities cooperating to cut tabs into the sheets and to bend the tabs toward the cavities; a pair of wipers between which the tabs pass which fold the tabs toward the metal; and a second pair of rollers between which the folded tabs pass for pressing the folds, the roller of the second pair which is on the same side of the sheets as the toothed roller having a plurality of grooves encircling its periphery the number and positions of which

correspond to the number and positions of the rows of cutting teeth, and means for moving the second pair of rollers relative to one another.

2. The device of claim 1 wherein the cutting teeth and cavities are arranged in staggered peripheral rows about the rollers.

3. A machine for splicing together a plurality of continuously moving sheets comprising a pair of drums having cylindrical surfaces with parallel axes of rotation, one drum being above the sheets and the other below the sheets, means for continuously directing the sheets between the drums, the surfaces of the drums being spaced apart a distance substantially equal to the combined thickness of the sheets, one of the drums having spaced cutting teeth on at least a portion of its surface, the other drum having a plurality of cavities in its surface complementary in position to the positions of the teeth in the opposing drum, means for rotating the drums in opposite directions about their axes as the sheets pass between the drums so that each tooth and socket combination cuts a tab through the sheets and bends the tab into the cavity without interruption in the passage of the sheets between the drums, a pair of stationary members positioned on opposite sides of the sheets and spaced from the drums in the direction of travel of the sheets, the stationary members being spaced apart by a distance less than the distance between the edge of a tab furthest from the sheets and the surface of a sheet furthest from the tab whereby the tabs are folded toward the sheets, and a pair of pressing rollers having cylindrical surfaces with parallel axes of rotation, the pressing rollers being positioned on opposite sides of the sheets and spaced apart by a distance substantially equal to the combined thickness of the sheets, the pressing roller on the same side of the sheets as the toothed drum being provided with a plurality of grooves, each encircling the roller in a plane normal to its axis of rotation, and each groove corresponding in position to the position of a tab on the sheet, whereby the tabs are pressed into the sheets while the sheets are distorted into the grooves to reduce the projection of sharp tab edges beyond the surface of the sheets without interruption in the passage of the sheets between the pressing rollers.

4. The machine of claim 3 with means for adjusting the spacing between the pressing rollers to accommodate different thicknesses of sheets and to increase the distance between the rollers between splicing operations.

5. The machine of claim 4 wherein the adjusting means comprises cam means for controlling the position of one of the pressing rollers and resilient means for biasing that roller into contact with the cam means.

6. The device of claim 4 wherein a portion of that drum having the toothed section includes a non-toothed section and wherein automatically disengaging clutch means stop the rotation of that drum when the non-toothed section is opposite the sheets.

7. A machine having tab cutting means, tab bending means and tab pressing means for splicing the trailing end of a first sheet to the leading end of a second sheet comprising: means for continuously feeding the first sheet to move through the machine past the tab cutting means, tab bending means and tab pressing means; means

for moving the second sheet through the machine when the trailing edge of the first sheet has almost reached the machine, with the leading end of the second sheet lying adjacent the trailing end of the second sheet to provide a limited span of doubled sheets for splicing purposes; means to disengage the tab cutting means and means to disengage the tab pressing means to make the machine inoperative when only a single sheet thickness is passing through the machine, and to engage the tab cutting means and the tab pressing means when the span of doubled sheets are passing through the machine; the tab cutting means having means to cut a plurality of tabs in the sheets and to bend the tabs away from the sheets while the sheets continue to move through the machine; the tab bending means comprising means to bend the tabs against an outer surface of the sheets while the sheets continue through the machine; the tab pressing means comprising a pair of rollers between which the sheets continuously pass as they move through the machine; the roller on the side of the sheets opposite the bent tabs having a plurality of grooves encircling the roller in a plane normal to its axis of rotation, each groove corresponding in position to the position of a tab; means for moving the rollers into contact with opposite sides of the span of doubled sheets except for the lack of contact at the grooves, the roller opposite the grooved roller having a solid cylindrical surface for pressing the tabs into the sheets while the portions of the sheets opposite the tabs expand into the roller grooves, thereby materially reducing the exposure of rough tab edges beyond the surface of the sheets and providing a strong splice, all without interruption in movement of the sheets through the machine.

8. The machine of claim 7 wherein the tab bending means comprises a pair of block members between which the sheets pass as they move through the machine; the block members extending substantially the full width of the sheets and being spaced apart less than the distance between the outwardly projecting ends of the tabs and the surface of the sheets opposite the tabs.

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